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(71) Applicant
John Melvin Mackinnon,
36 Ringwood Road, Brimington, Chesterfield,
Derbyshire S43 1DG

(72) Inventor
John Melvin Mackinnon

(74) Agent and/or Address for Service
A A Thornton & Co,
Northumberland House, 303–306 High Holborn,
London WC1V 7LE

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(58) Field of search
H2H

(54) Electrical power supply for a pedal-driven vehicle

(57) The supply has a generator system 1,2,3 which generates electrical power when the vehicle is in motion, a battery 5 charged by the generator, and control means 6 arranged to control the supply to a load 8 from either the generator or the battery 5 so that power can be supplied to the load irrespective of whether or not the vehicle is in motion. The control 6 may be a manually operated switch, or a switch operated by a vehicle speed sensor, or a voltage responsive switching circuit such as an arrangement of diodes or a relay (RL1) operated by a transistorised voltage sensor (B), (Fig. 3).

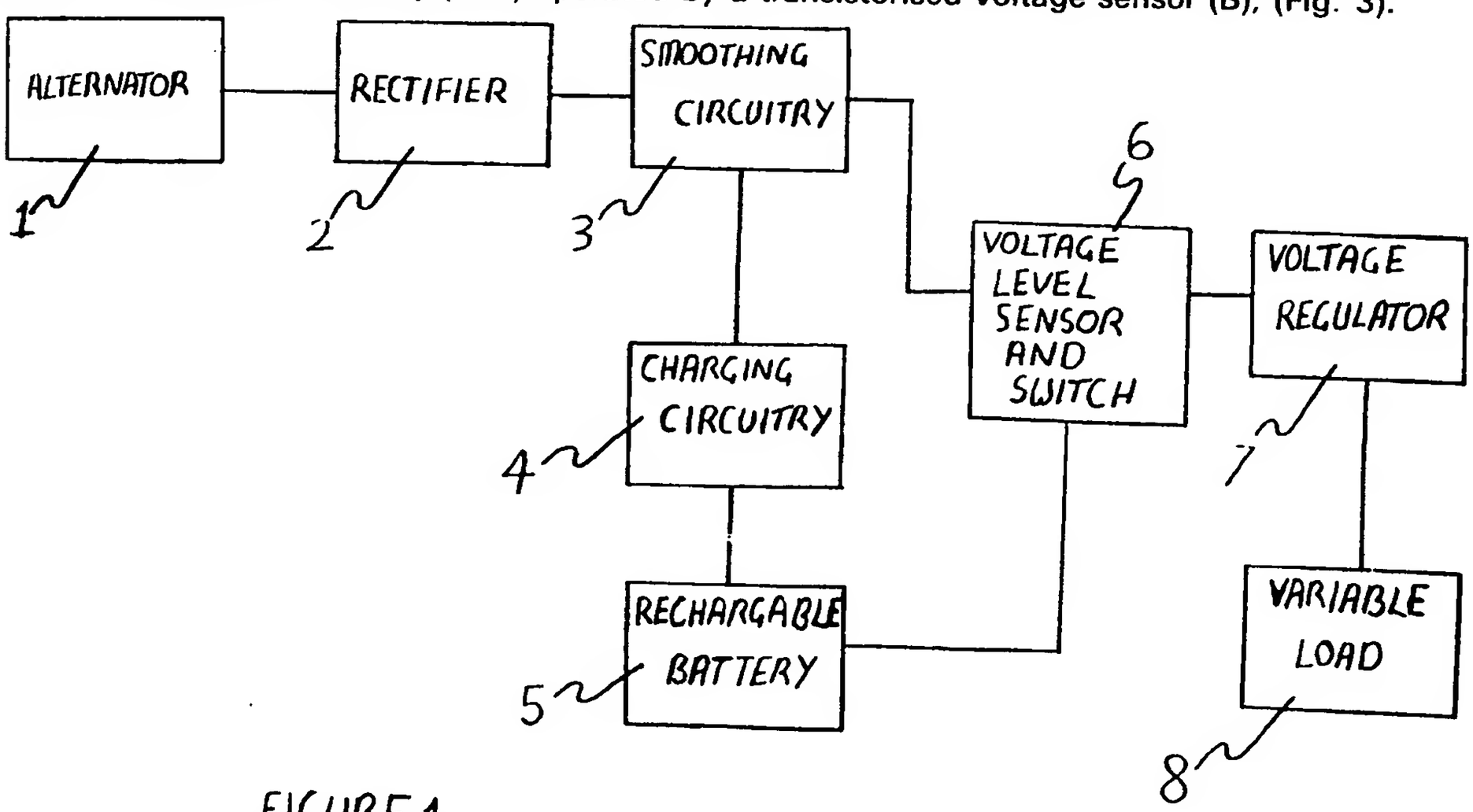

FIGURE 1

The drawing(s) originally filed was/were informal and the print here reproduced is taken from a later filed formal copy.

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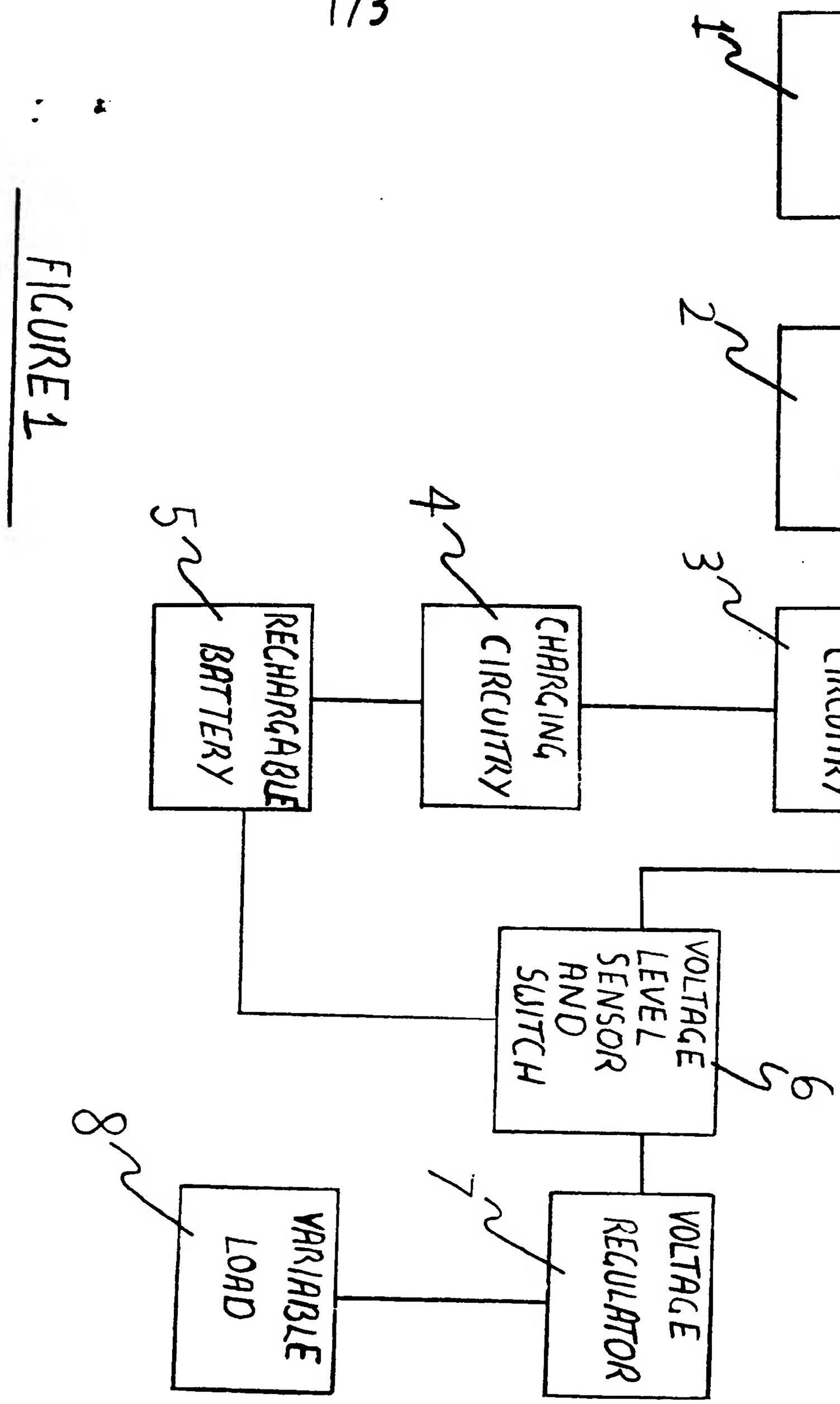


FIGURE 1

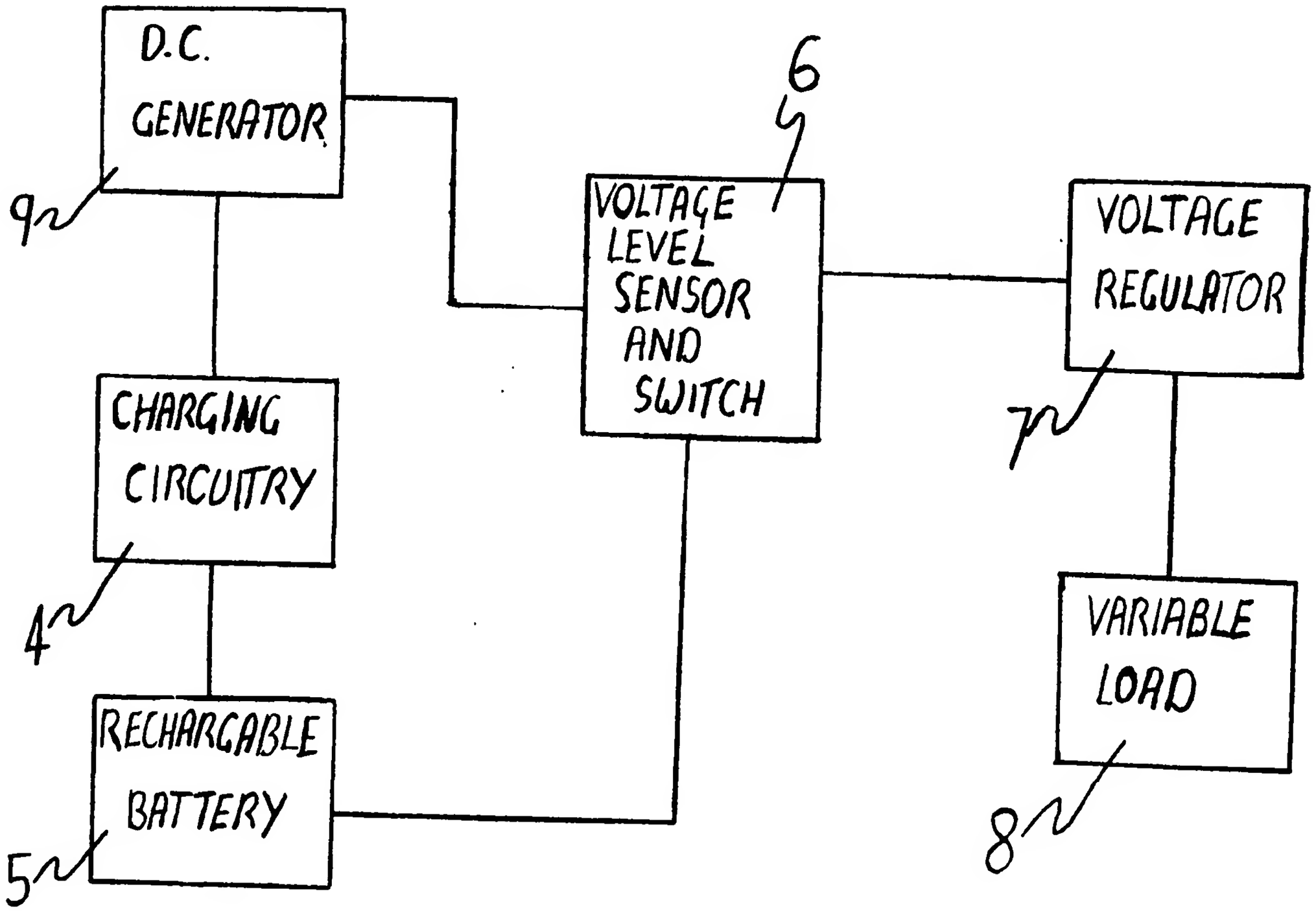
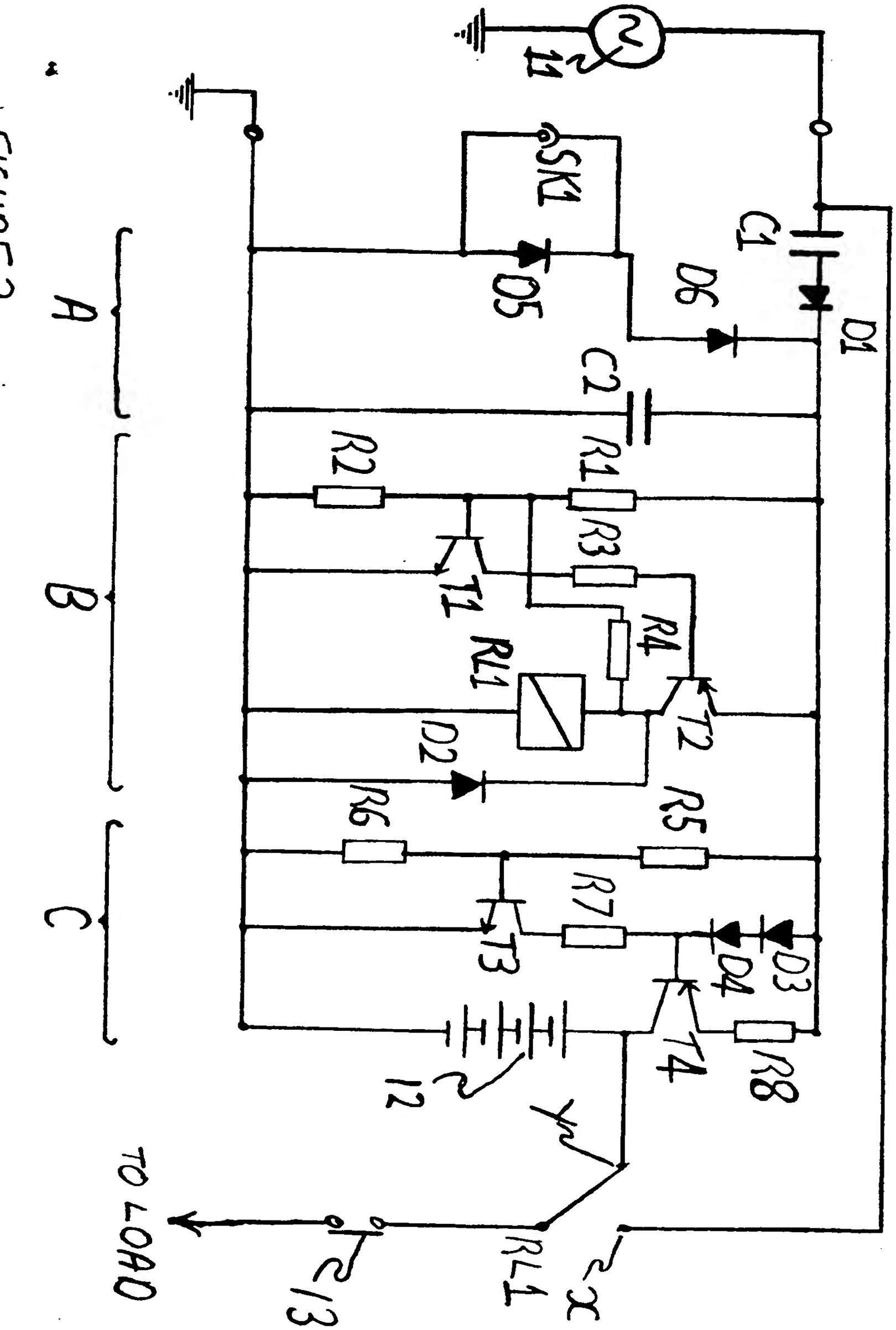


FIGURE 2

FIGURE 3



SPECIFICATION

Electrical power supply device

This invention relates to an electrical power supply device for use with pedal-driven vehicles such as bicycles, tricycles, pedal-cars and the like.

Man-powered vehicles, such as bicycles, are normally provided with electrically driven auxillary equipment, such as electric lights. It is known to provide batteries, housed at a convenient position on the vehicle, in order to provide electrical energy to power and the lights. However, batteries run down, and must be regularly replaced.

It is also known to provide electrical generators, such as dynamos, which are capable of producing electricity when the vehicle is in motion, to provide power for the lights. The major problem with this type of system is that no electrical energy can be supplied when the vehicle is at rest or moving slowly, and, consequently, no, or not sufficient, power can be supplied to the lights.

There is therefore a need for the provision of an electrical power supply for use with pedal-driven vehicles which can provide a constant amount of electrical power to electrical auxiliary equipment, whether the vehicle is in motion or at rest, and without the need for frequent replacement of batteries.

The present invention provides an electrical power supply device for a pedal driven vehicle, said electrical power supply device comprising a generating means arranged to generate electrical power when the vehicle is in motion, a storage means for storing electrical power, and control means arranged to control the supply of electrical power to a load from either the generating means or the storage means, whereby power may be supplied to the load irrespective of whether or not the vehicle is in motion.

Features and advantages of the present invention will become apparent from the following description of embodiments thereof by way of example with reference to the accompanying drawings, in which:

Figure 1 is a block diagram of the circuitry of one embodiment of the electrical power supply device;

Figure 2 is a block diagram of the circuitry of another embodiment of the electrical power supply device; and

Figure 3 shows a specific example of circuitry which could be utilised in the present invention.

Fig. 1 shows an electrical power supply device where electrical power is supplied by a suitable alternator 1 which is adapted to be driven by the pedal-driven vehicle when the vehicle is in motion. Such adaption is well-known in the art, as set out above. Preferably, a single phase alternator is used.

The alternator 1 generates an alternating current when the vehicle is in motion, and a rectifier 2 is provided to convert the a.c. output of the alternator into direct current. Any standard rectification circuitry can be used, e.g. full-wave bridge rectifier.

Suitable smoothing circuitry 3 may be provided to reduce the ripple factor of the signal from the rectifier 2.

A rechargeable battery pack 5 is housed at a suitable position on the vehicle and contains batteries of the rechargeable type. It is possible to use any type of rechargeable battery, but Nickel-Cadium cells are preferred for reasons of size, weight and safety.

Some of the rectified and smoothed electrical current provided by the generating means (alternator 1, rectifier 2, smoothing circuitry 3) is used to charge the rechargeable batteries 5 via charging circuitry 4. The charging circuitry 4 may be of any suitable type, depending on the type of battery being charged. The charging circuitry 4 would be arranged to sense when the batteries are fully charged, and then to discontinue the charging process.

If desired, a voltage level sensor and switch 6 is provided prior to a voltage regulator 7. The voltage regulator 7 receives an unregulated input voltage either directly from the generating means 1, 2, 3, or from the battery pack 5, via the voltage level sensor and switch 6. The voltage regulator 7 supplies a constant voltage at its output for variable load 8. Voltage regulators are well-known in the art, and the voltage regulator 7 can be of any standard type, e.g. regulator incorporating a series-pass transistor, or a switching regulator.

The voltage level sensor and switch 6 monitors the level of the voltage provided from the generating means 1, 2, 3. If this voltage falls below a certain predetermined level, which would be determined depending upon the approximate size of the load and the minimum amount of voltage required at the input to the voltage regulator, then the voltage level sensor and switch 6 supplies voltage to the regulator 7 from the battery-pack 5. If the generator voltage is above the predetermined level, voltage is supplied to the regulator from the generator 1, 2, 3. The voltage level sensor and switch 6 can be any suitable form of circuitry, such as an arrangement of diodes, for instance.

The rechargeable batteries would be chosen having an operating voltage above that of the predetermined level.

In operation electric power will be supplied from the generator 1, 2, 3 when the vehicle is moving at a suitable speed, and from the battery pack 5 when the vehicle is moving too slowly to drive the generator at a reasonable rate, or when the vehicle is stationary. In this manner the electrical auxiliaries provided on a pedal-driven vehicle are provided with a constant amount of electrical power.

Fig. 2 shows an embodiment of the invention in which a standard d.c. generator 9 is used to supply power, rather than the alternator as in the above system. This system has an advantage over the above embodiment in that it does away with the need for rectification and smoothing circuitry.

However, the use of an alternator to provide power is preferable, because power can be provided at low vehicle speeds and there are no commutator rings to wear down.

A specific example of electrical circuitry which could be used to put the invention into operation is shown in Fig. 3. A dynamo 11, adapted to be driven by the pedal driven vehicle, supplies power to a rectifying, smoothing and voltage doubling circuit A, which includes capacitors C_1 and C2 and diode D1. Power is also supplied from the dynamo 11 to one contact X of a relay RL1. A voltage sensing and switching circuit B senses whether the voltage from the voltage doubling circuit is above a certain value, and operates the relay RL1 depending upon the value of the voltage. The voltage sensing circuit comprises resistors R_1, R_2, R_3, R_4, transistors T_1 and T2, and diode D2.

A battery charging circuit C is connected to the voltage double A and voltage sensing and switching circuit B so as to receive current from the dynamo 11 to charge the battery 12. The battery charging circuit comprises resistors R_5, R_6, R_7, R_8, diodes D_3 and D_4, transistors T_3 and T_4, and rechargeable battery 12.

In operation, the voltage sensing and switching circuit B is arranged to detect whether the voltage from the voltage doubler A is above a predetermined level. If the voltage is above a predetermined level the relay RL1 is switched so that the dynamo is connected directly to the load (via manually operable switch 13) i.e. the relay RL1 is switched to contact X. When the voltage is below a certain predetermined level, the relay RL1 is switched so that the load is connected to the battery 12 (via manually operable switch 13) i.e. the relay RL1 is switched to contact Y.

It should be noted that the voltage sensing and switching circuitry B incorporates an hysteresis feature (i.e. the predetermined switching value varies depending on the position of the relay RL1) so as to avoid spurious switching of the relay at a value close to the switching voltage.

Also a circuit comprising adaptor socket SK1 and diodes D5 and D6 is provided for allowing the battery 12 to be recharged from a mains supply when the vehicle is not in use.

It should also be noted that no separate voltage regulator is included in this circuit. If a constant voltage output is required a voltage regulator could be included between the relay switch and the load. The voltage regulator is, however, an optional requirement.

The values of these components will vary depending upon the size of the battery and the dynamo being used.

It should be noted that operation of the switch power to the load from either the generator or the battery need not be controlled by a voltage sensor included in the circuitry. A sensor could be utilised which monitors the velocity of the pedal driven vehicle, for example, actuating the switch when the vehicle velocity crosses a predetermined value. The switch could even be manually operable.

The electrical power supply device according to this invention would be for use primarily for the front and rear lights on a pedal-driven vehicle such as a bicycle. However, it could also be used to provide power for other electrical auxiliary equipment, such as brake lights, flashing indicators, and other electrical accessories which could be provided on a pedal-driven vehicle.

It should be noted that advantageously the load (i.e. front and rear lights) is removable from the vehicle to prevent theft, suitable connectors being supplied for detachably connecting the power supply device to the load. It is also envisaged that part of the power supply device itself could be removable (i.e. all the circuitry, including battery, possible,—the generator remaining attached to the vehicle).

CLAIMS

1. An electrical power supply device for a pedal driven vehicle, said electrical power supply device comprising a generating means arranged to generate electrical power when the vehicle is in motion, a storage means for storing electrical power, and control means arranged to control the supply of electrical power to a load from either the generating means or the storage means, whereby power may be supplied to the load irrespective of whether or not the vehicle is in motion.

2. An electrical power supply device in accordance with claim 1, wherein said storage means is a rechargeable battery.

3. An electrical power supply device in accordance with claim 2, wherein said storage means is arranged to be charged by electrical power from said generating means.

4. An electrical power supply device in accordance with claims 2 or 3, wherein said storage means is provided with an adaptor to enable it to be charged from a mains electricity supply.

5. An electrical power supply device in accordance with any preceding claim wherein said control means comprises switching means arranged to connect the load to the generating means or to the storage means.

6. An electrical power supply device in accordance with claim 5 wherein there is provided a voltage level sensor arranged to

monitor the level of voltage supplied by the generating means, and to actuate said switching means when the voltage level reaches a predetermined value.

7. An electrical power supply device in accordance with claim 6 wherein the size of the predetermined value depends upon whether the voltage level is increasing or decreasing.

8. A pedal driven vehicle including an electrical power supply device, said electrical power supply device comprising a generating means arranged to generate electrical power when the vehicle is in motion, a storage means for storing electrical power, and control means arranged to control the supply of electrical power to a load, whereby power may be supplied to the load irrespective of whether or not the vehicle is in motion.

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